Worksheet 1 Thinking abstractly **Answers**

Task 1

1. Give examples of some problems which can be tackled by building models or computer simulations

   Predictions of global warming, effects of climate change,

   likely scale and effects of population increases

   number of doctors and teachers required in 10 years' time

   prediction of likely consequences of an earthquake

   financial modelling to predict future profits/losses.

   Likely spread of a disease such as Ebola or zika virus

   Saving in fuel of a new car/aircraft design

2. What factors would be relevant in a financial model which calculates the likely annual profit in a new coffee shop?

   Some suggestions:

   The store rental, opening hours, number of people passing the shop on weekdays/weekends, number of people that can be served in a one-hour period

   Price of coffee, milk, sugar, price that it would be reasonable to charge, number of staff required, cost of wages, set-up costs

   What factors would be irrelevant?

   Arguably, the floor area of the shop, the length of the shop lease, the colour scheme used, average age of population in the area, the local weather. Could also suggest: the name of the manager, the gender/age of the staff in the shop, the size of the cups, efficiency of the dishwasher, etc.

   Think about number of other coffee shops in the area, whether it is an affluent area.

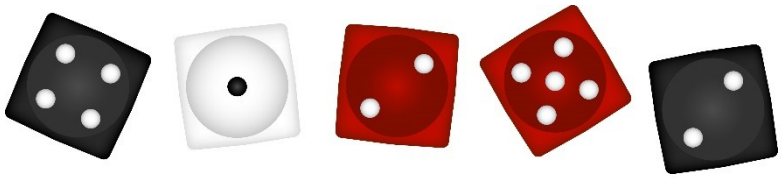
   Are these relevant to a model or not? In building a model it is not practical to build in every factor … some factors may be relevant but are better dealt with by common sense and experience rather trying to build them into a numerical model.

   In a later lesson "heuristic solutions" will be discussed.

Task 2

3. Solve this puzzle.

Roll 1



The answer to Roll 1 is: 4

Roll 2

The answer to Roll 2 is: 8

Roll 3

The answer to Roll 3 is: 14

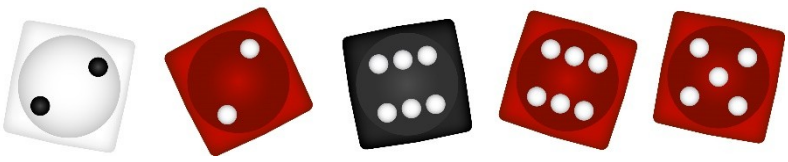
Roll 4

The answer to Roll 4 is: 0

Roll 5

The answer to Roll 5 is: 4

Roll 6



What is the answer to Roll #6?

Why?

If students get stuck and need a little clue, you can tell them that the name of the game is 'Petals around the rose'. This name is significant.

The "rose" is the single dot in the middle in throws of 1, 3 and 5. In the first throw, only the throw of five has dots surrounding the rose in the middle. The "petals" are the dots surrounding the one in the centre.

The lesson here is to take into account all the information given! It is also an exercise in applying abstraction (information hiding), in that the numbers signified by the dots are irrelevant here – if the problem was not given in the context of dice, the solution might be more obvious.

There are other problems which use a similar principle. An example is to be able to produce a correct sentence, having heard 3 or 4 examples:

"I like cabbage but I don't like beans"

"I like cheddar but I don't like Stilton"

"I like butterflies but I don't like moths"

The answer is that if the word contains a double letter, it's in the "I like" category. Again, the actual words are irrelevant and the problem would be easier to solve with random letters.